

# Effectiveness of Remediation in the Cochato River, Baird & McGuire Superfund Site

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# Acknowledgements

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# Presentation Overview

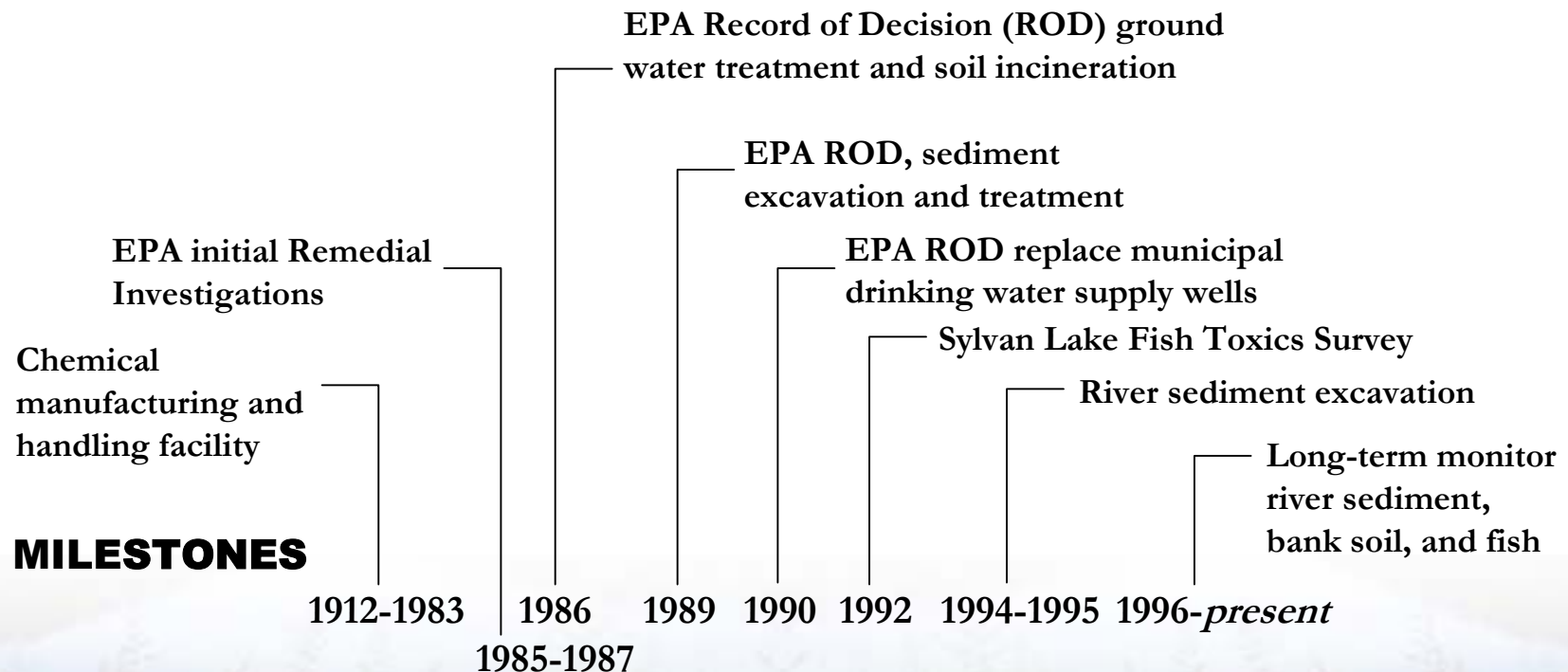
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- **Site History and Background**
- **Long-Term Monitoring Program**
  - Objectives
  - Stations Monitored
  - Parameters Monitored
- **Results of Monitoring**
  - Fish
  - Sediment and River Bank Soil
- **Summary and Conclusions**





# Baird & McGuire Site History

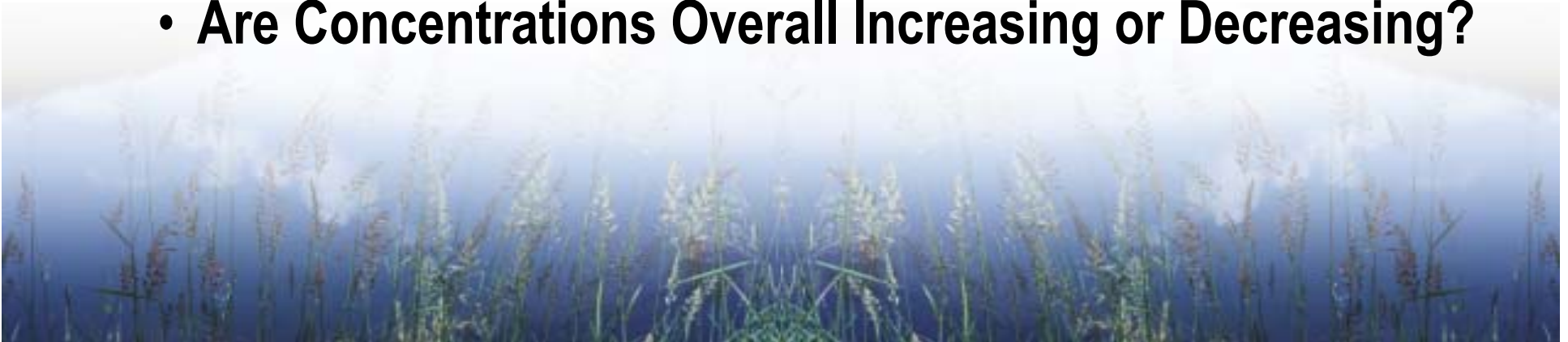




# Long-Term Monitoring Program Asks the Following Questions

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- **Are Concentrations of COCs in Fish Fillets Below Project Action Limits (PALs)?**
- **Are Concentrations in Sediment and River Bank Soil Below PALs?**
- **Are Time Trends Apparent, and if so, in Which Medium and Where?**
- **Are Concentrations Overall Increasing or Decreasing?**







# Monitoring Stations in the Cochato River

Listed Up to Downstream:

**Station A** - Control location upstream and outside the influence of the Site

**Station E** - Adjacent to the Site (area of excavation)

**Station B** - Between Union and Center Streets

**Station C** - Ice Pond reach of the River

**Station D** - Mary Lee Wetlands reach





# Cochato River On Site and Downstream 4-Years Post-Remediation

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**Station E, adjacent to the Site area of excavation in the River (Battelle, 1999)**



**Station B, 400-meters downstream of the Site and excavation (Battelle, 1999)**





# Long-Term Monitoring Program Measurement Parameters 1988-2000

Parameter	1988	1992	1996	1997	1998	1999	2000
<i><b>Sediment/Soil Chemistry</b></i>							
Arsenic	X	—	X	X	X	X	X
Chlorinated Pesticides and PAHs	X	—	X	X	X	X	X
<i><b>Tissue Chemistry</b></i>							
Arsenic	—	X	—	—	—	—	—
Chlorinated Pesticides and* PAHs	—	X	X	—	—	X*	X*
PCB	—	X	—	—	—	—	—
Dioxin/Furans	—	X	—	—	—	—	—
<i><b>Ancillary Measurements</b></i>							
Grain Size (sediment/soil)	X	—	—	X	X	X	X
TOC (sediment/soil)	X	—	X	X	X	X	X
% Lipid (tissue) and Fish Aging	—	X	—	—	—	X	X





# Species, Ages and Sample Size of Fish Fillets in 1999 for Tissue Chemistry

Parameter	Units	Station and Species								Program Year
		A		B	C	D	Sylvan Lake (SL)			
		PS	RP	BG	BG	RP	BB	BB	CP	
Approximate Age <sup>a</sup>	Year	3 - 4	3 - 6	2 - 4	2 - 5	2 – 4	NA	NA	8	1999
Sample Size <sup>b</sup>	N	8	4	14	8	8	1	1	1	1999

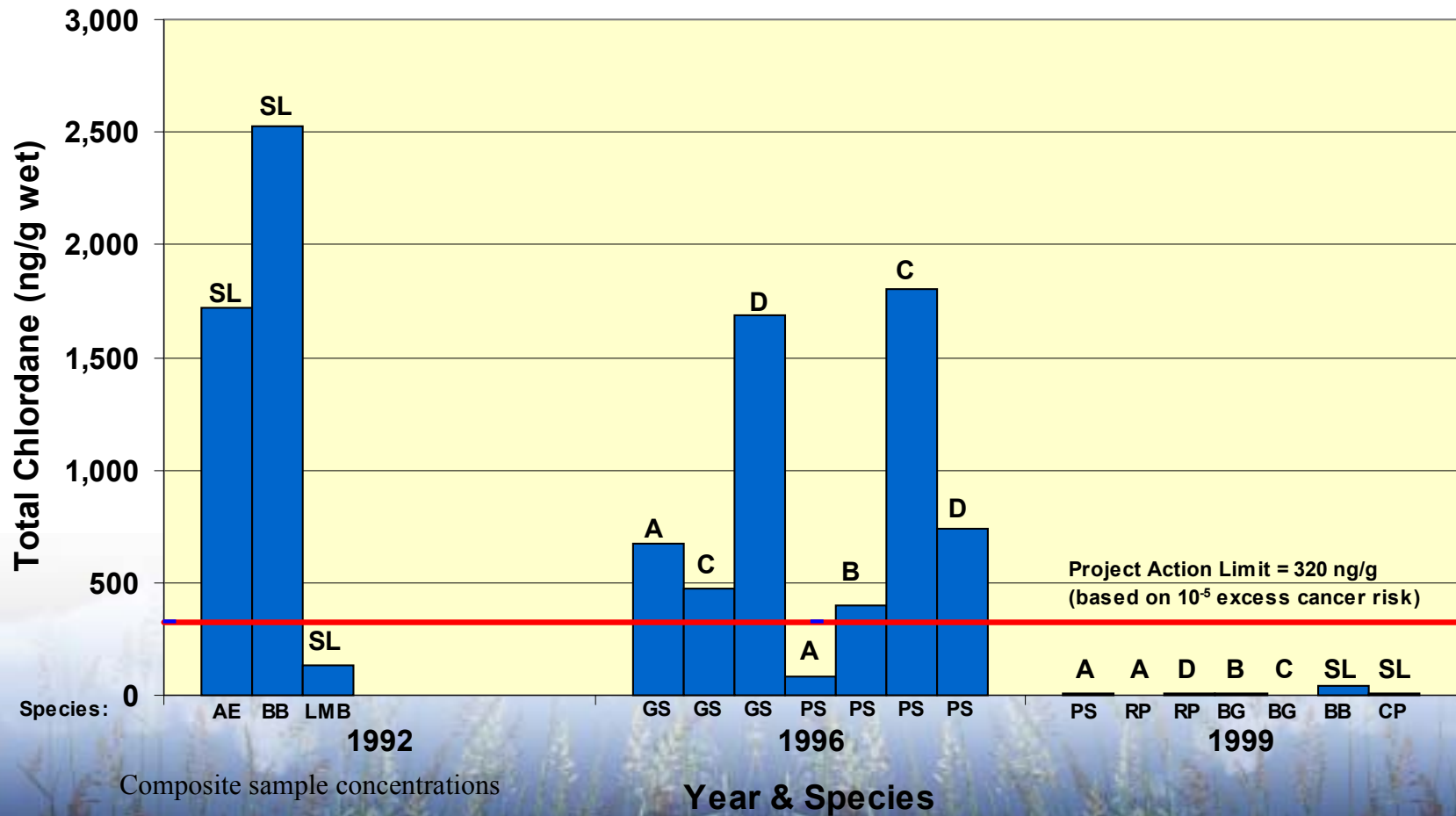
**BB – brown bullhead; BG – bluegill; CP – chain pickeral; PS – pumpkinseed; RP – redfin pickeral**  
**NA – Not applicable/available because age analysis not performed on brown bullhead.**

<sup>a</sup> Fish aged using fish scale analysis for individual fish used in composite fillets.

<sup>b</sup> Age analysis on a total of 43 fish that produced 17 composite fillets for tissue chemistry.

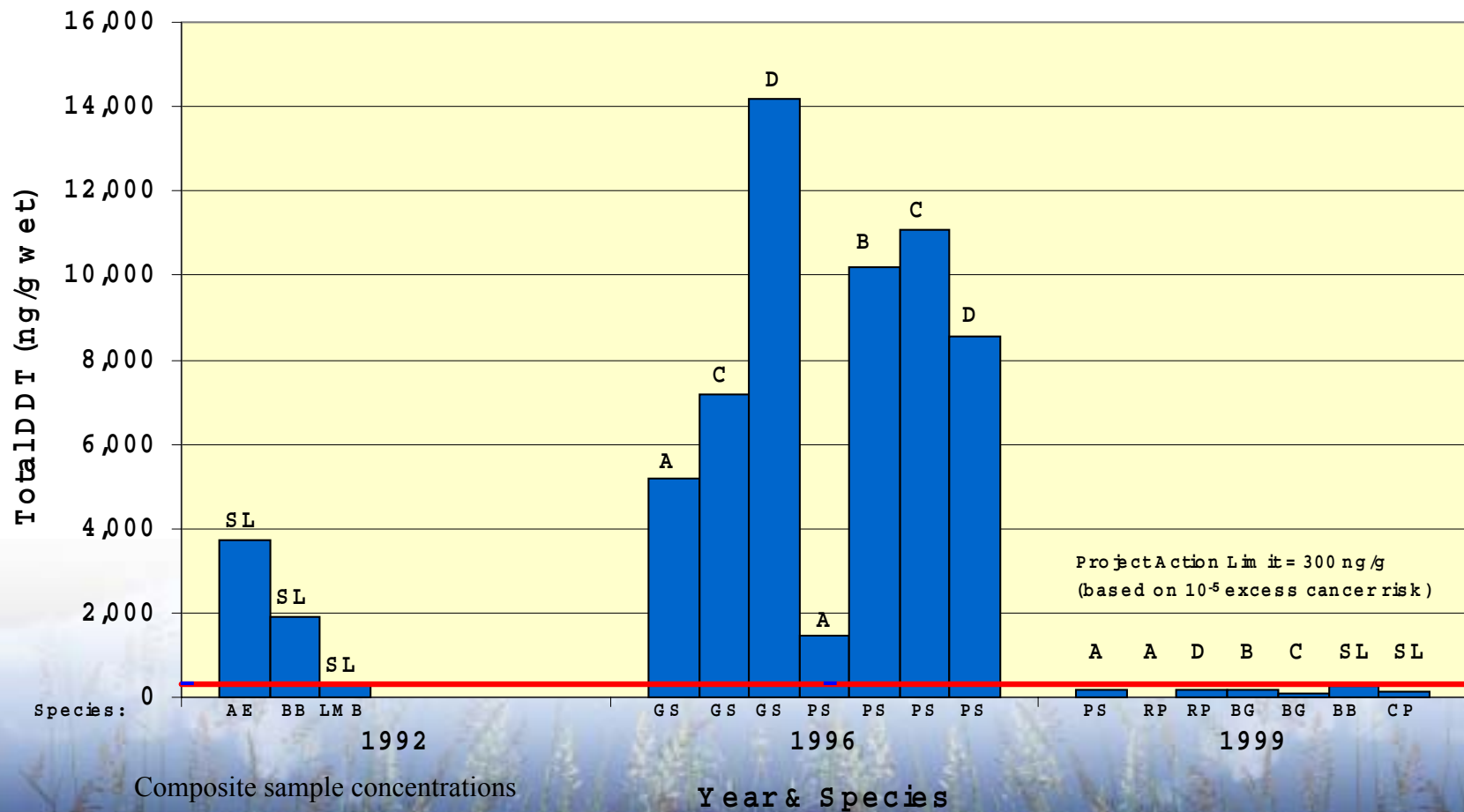


# Total Chlordane in Fish Fillet, 1992-1999



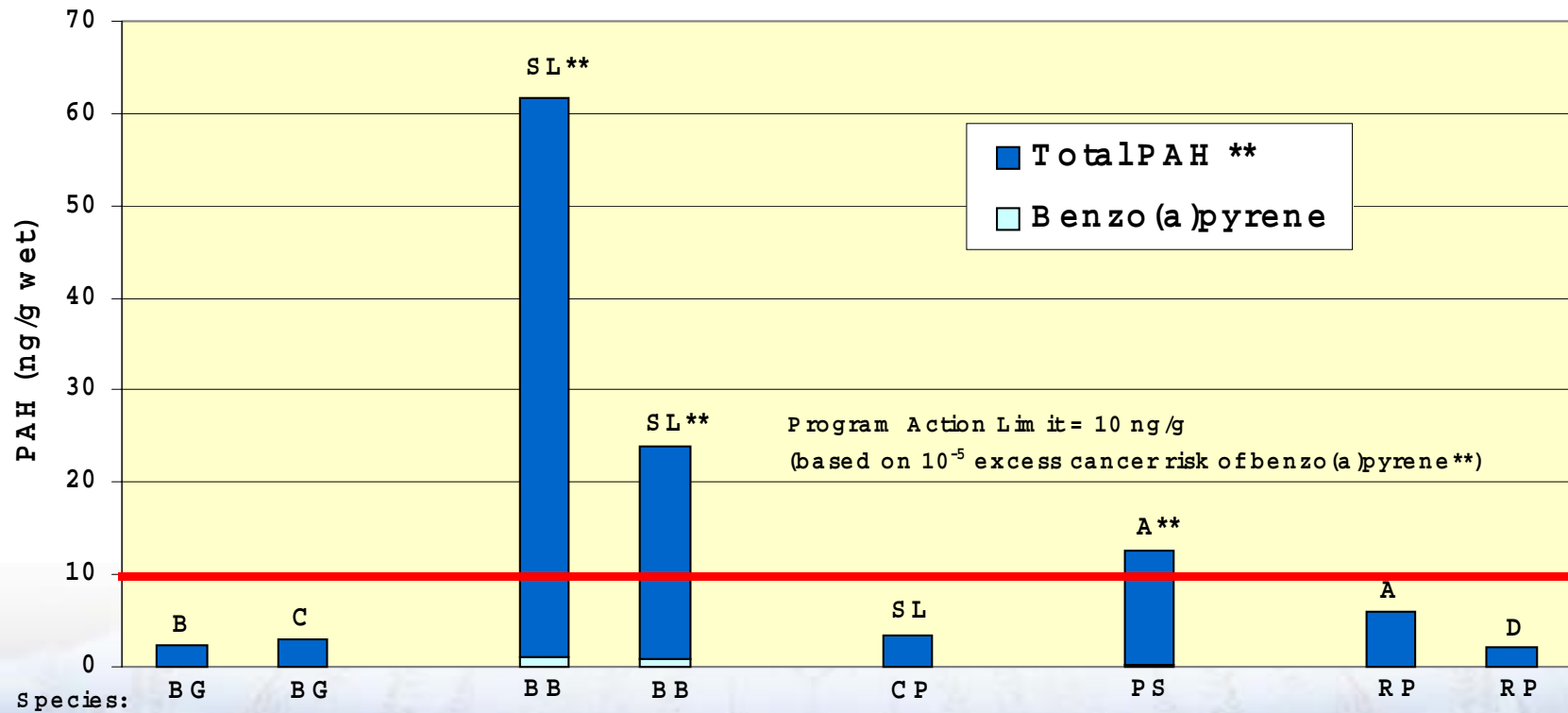


# Total DDT in Fish Fillet, 1992-1999





# PAH in Fish Fillet, 1999



Composite sample concentrations

1999 & Species





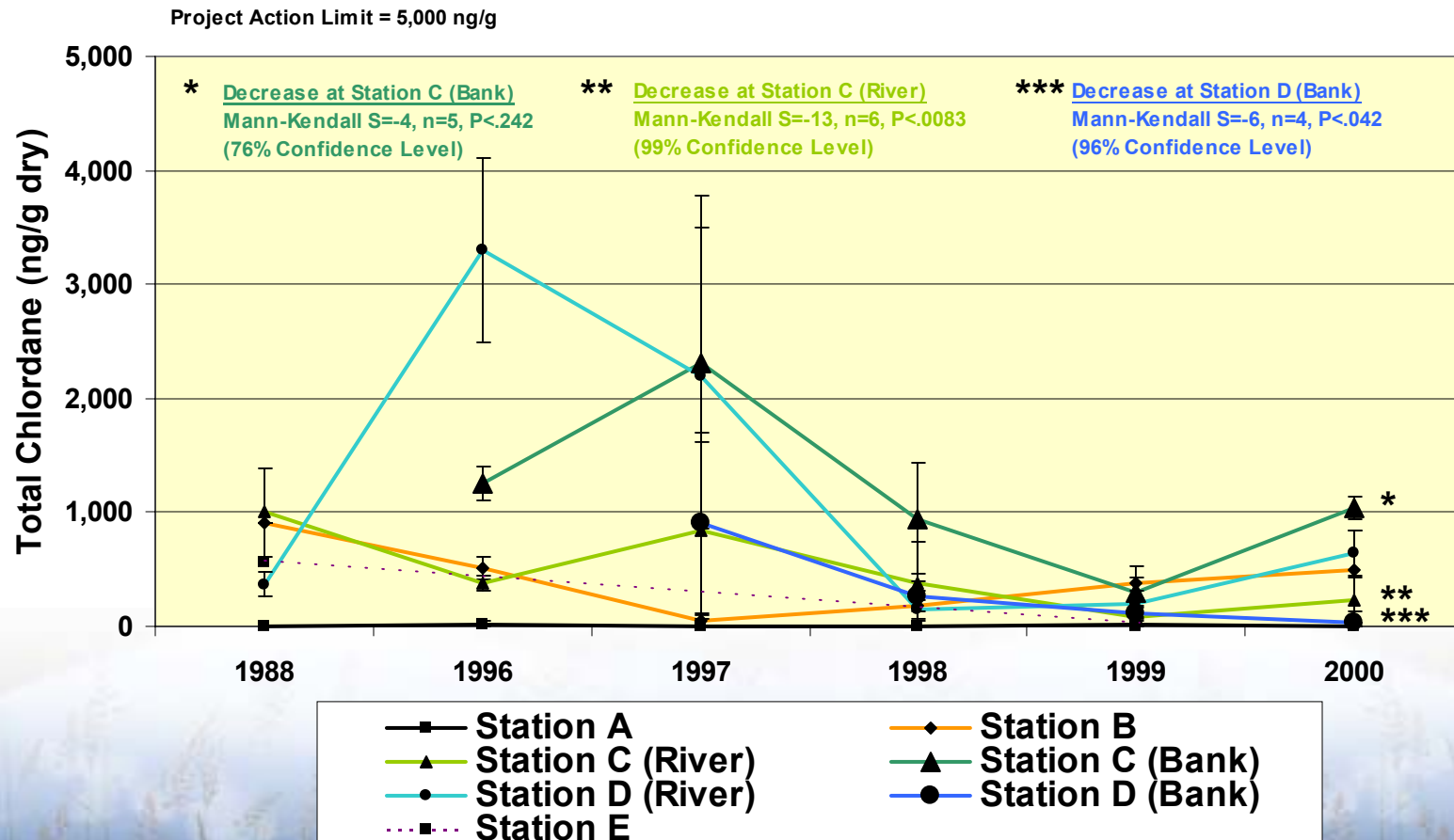
# Overall Trends in Fish Contamination 1992-1999 or 1996-1999<sup>a</sup>

Station	Station Description	Total DDT	Total Chlordane	Total PAH
Station A	Control	↓	↓	No Trend
Station E	Adjacent to the Site	No Sample	No Sample	No Sample
Station B	Between Union and Center Streets	↓	↓	No Trend
SL	Sylvan Lake	↓	↓	No Trend
Station C	Ice Pond	↓	↓	No Trend
Station D	Mary Lee Wetlands	↓	↓	No Trend

<sup>a</sup> Decreases in 1996-1999 fish from Stations A-D, and 1992-1999 fish from Sylvan Lake

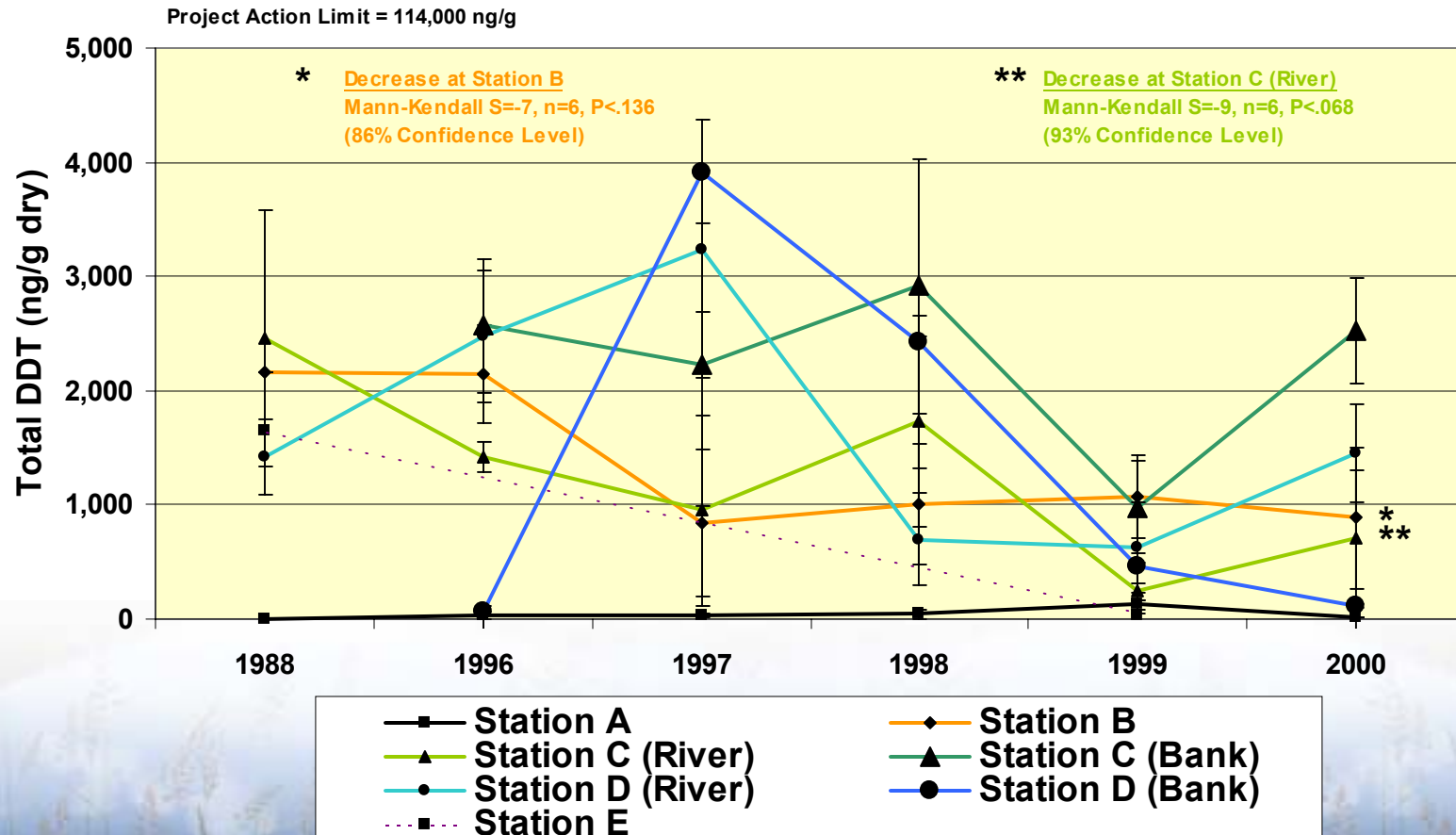


# Mean Total Chlordane in Sediment and River Bank Soil, 1988-2000



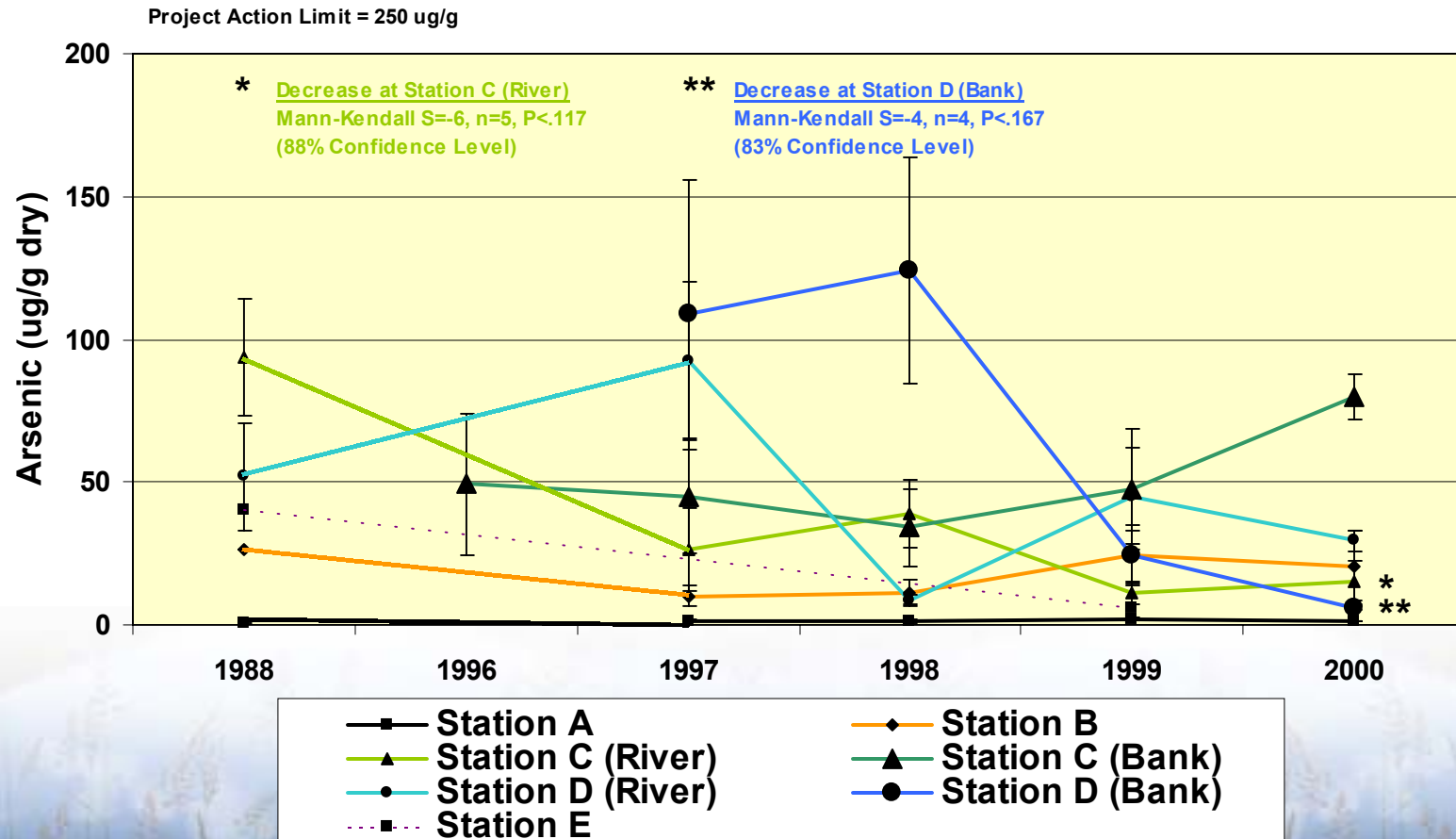


# Mean Total DDT in Sediment and River Bank Soil, 1988-2000





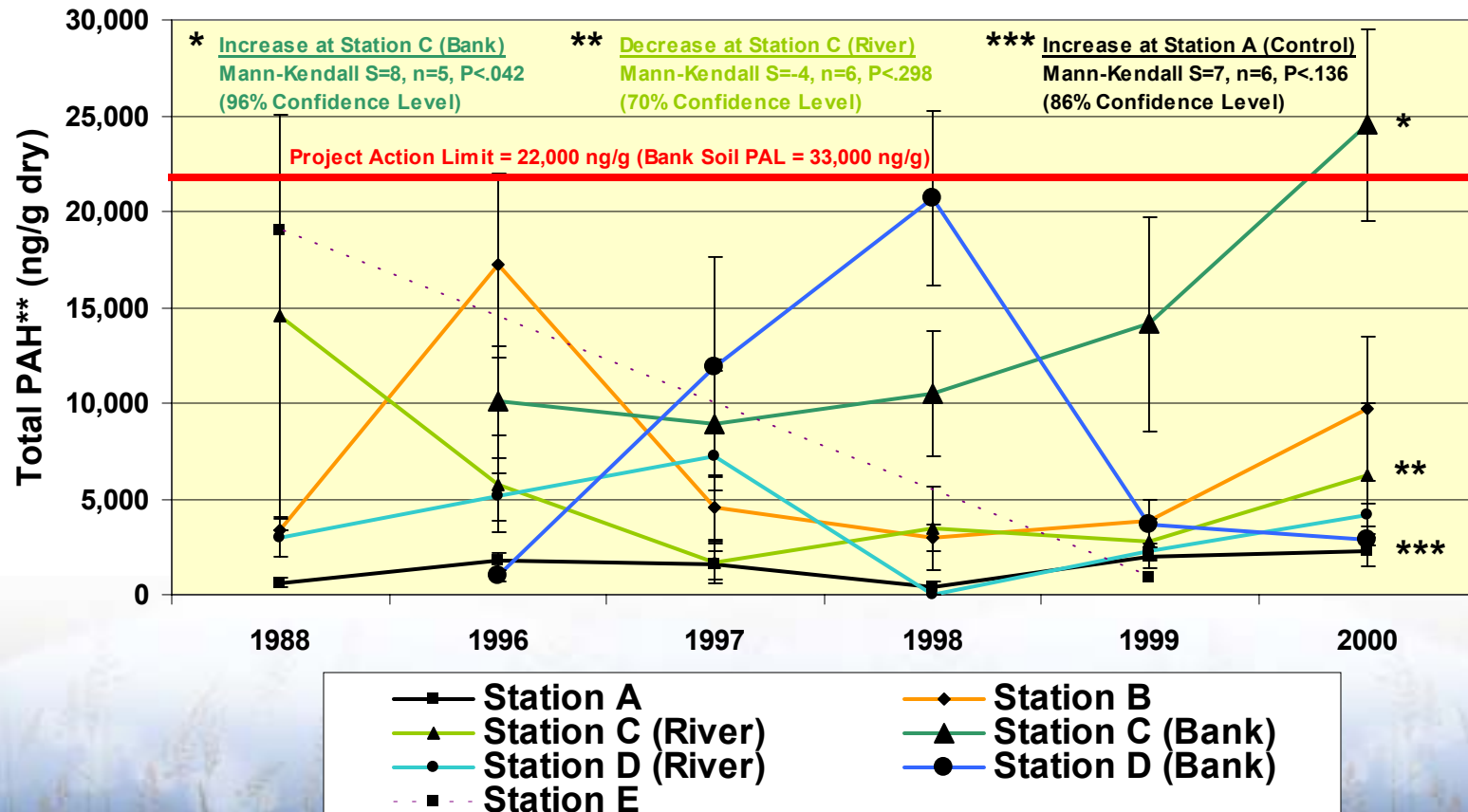
# Mean Arsenic in Sediment and River Bank Soil, 1988-2000







# Mean Total PAH in Sediment and River Bank Soil, 1988-2000





# Overall Trends in Sediment and River Bank Soil Contamination 1988-2000

Station	Station Description	Arsenic	Total DDT	Total Chlordane	Total PAH
Station A	Control	No Trend	No Trend	No Trend	↑
Station E	Adjacent to the Site	No Trend	No Trend	No Trend	No Trend
Station B	Between Union and Center Streets	No Trend	↓	No Trend	No Trend
Station C	Ice Pond, River	↓	↓	↓	↓
Station C	Ice Pond, Bank	No Trend	No Trend	↓	↑
Station D	Mary Lee Wetlands, River	No Trend	No Trend	No Trend	No Trend
Station D	Mary Lee Wetlands, Bank	↓	No Trend	↓	No Trend

Apparent trends in 1988-2000 sediment concentrations were estimated using Mann-Kendall test (Gilbert, 1987)



# Summary - Sediment and River Bank Soil Monitoring

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- **Concentrations Were Below Media-Specific PALs**
- **Single Year Peak in Concentrations 1-3 Years After Remediation, but Overall Downward Trends from 1988 to 2000, Except for Total PAH**
- **Upward Trend in Total PAH in Sediment at Station A (Upstream) and in River Bank Soil at Station C**
- **River Bank Soils Are Likely Depositional for Fine Grain Particle-Bound Contaminants**





# Summary – Fish Monitoring

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- **In 1999, Concentrations in Fish Were Below Chemical-Specific Project Action Limits (PALs)**
- **B(a)P and Total DDT in Large Bullhead from Sylvan Lake Approached PALs, and Fish Upstream of the Site had Higher Total PAH Compared to Others**
- **A Year After Remediation (in 1996), Concentrations in Fish had Increased**
- **Within 4-Years Post-Remediation, Concentrations in Fish had Decreased Significantly to Below PALs**







# Conclusions

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**Remediation of Contaminated Sediment Was Effective in Significantly Reducing Concentrations in Fish and Risks Within 4-Years**

**Site Remediation Fostered Downward Trends in Contamination of Sediment and River Bank Soil Within 4-Years, with Exception of Total PAH**

